

STANDARD FORM NO. 64

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*Office Memorandum* • UNITED STATES GOVERNMENT

TO : The Files

DATE: 23 July 1956

FROM : [REDACTED]

SUBJECT: RS-11A/B - Contract XG-1355 and RD-85, T.O. 2

1. General - A visit was made to the [REDACTED], Connecticut, on 12 July 1956 for the purpose of monitoring the RS-11A/B & RS-11A/B Power system development activity. Present were:

[REDACTED]

OC-E/R&amp;D-EP

2. Background - The company had advised three weeks earlier that they were shipping what they believed to be acceptable prototype samples of the RS-11A and RS-11B. Follow-up telephone inquiries indicated that the second RS-11B was not completed, but would be available along with three transmitters for delivery at the time of this visit to the contractor. The visit was specifically prompted by the fact that [REDACTED] was to shut down for the last two weeks in July. Present transmitter design deficiencies concern excessive harmonic radiation in the TV bands and excessive key click radiation. Receiver deficiencies include method of frequency dial presentation, receiver sensitivity, output impedance, and receiver raw noise figure. There are also under consideration several minor design improvements being brought to [REDACTED] attention, since they represent an increase in the scope of the work. The contractor is already one year behind schedule, and is not felt that additional engineering work should be referred to [REDACTED] until contracted performance improves.

3. Equipment Delivery - The contractor delivered two each RT-11A transmitters and one each RT-11B transmitter. The contractor feels that these three modified transmitters represent final prototype samples. They will be evaluated by the Laboratory. The transmitters have additional TVI circuitry incorporated. The silver keying contacts have been replaced by vanadium-tungsten contacts. The key click suppressor-condenser across the key has been raised from .01 mfd to .1 mfd. The attached schematic shows the new TVI circuitry in red.

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4. Equipment non-delivery - The initial RR-2B receiver is currently being evaluated by the Laboratory. Immediately prior to departing for Connecticut, the Laboratory advised that receiver sensitivity varied from 8 to 40 microvolts over the range of 12 to 30 megacycles. The contractor was so advised. [ ] was of the opinion that an equipment defect had developed since the equipment had been shipped. The second RR-2B prototype sample was not available for delivery as promised. The contractor had been advised earlier that the Government was interested in the delivery of prototype samples such as represented acceptable prototype equipment in the opinion of the contractor. At the time of this visit, the company was engaged in frequency calibration measurements of the RR-11B receiver after exposure to minus 40 degree temperatures. It was indicated that frequency drift at this temperature was in the neighborhood of 20 kilocycles. It was also implied that additional difficulties were encountered with control malfunctioning at minus 40 degrees.

5. Receiver output impedance - The contractor's engineering aggressiveness has been affected by the company's two changes in management and engineering personnel. The problems of output impedance encountered by [ ] is herewith described in some detail to illustrate as a case in point, the character of [ ] engineering progressiveness. The equipment specifications require that the output impedance be 4000 ohms when measured with a signal modulated at 1000 cycles. The initial design of the output stage of the RS-11 receiver consisted of a 1AD5 as a voltage amplifier with an output impedance of 700,000 ohms and a current drain of .9 milliamps. [ ] drawings indicate that the primary of the output transformer has an impedance of 30,000 ohms, and the secondary, 4000 ohms. However, the contractor erroneously made impedance measurements with a signal modulated at 400 cycles. The output impedance, when measured at 1000 cycles, looks like 12000 ohms. The Government recommended that the contractor consider the substitution of a 1AG4 as the power output tube. This tube has an impedance of 180,000 ohms and a load of 1200 ohms. The current is 2.4 ma. Thus impedance matching to a 4000 load could be optimized with a transformer of proper turns ratio and current carrying capability. [ ] subsequently modified the equipment for the 1AG4, but did not provide a new transformer. The present transformer saturates with the 2.4 ma D.C. through the windings. The company then reverted back to the 1AD4 voltage amplifier and placed a 4000 ohm resistor across the secondary. The Government does not feel that placing a resistor across the secondary of the transformer is an acceptable engineering practice. The contractor is presently awaiting delivery of a new transformer replacement, since all printed board dimensions are based on the use of this miniaturized transformer, and perhaps feels, along with the Government, that a major redesign might be necessary in order to accommodate an output transformer having optimum characteristics. The need for a bias voltage was discussed, and it was pointed out, as advised earlier, that the BA-1315/U battery no longer has the A- terminal of the battery grounded or brought to the case exterior. The contractor was also invited to consider the utilization of a bleeder network to provide the necessary bias voltage.

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a. Work was initiated on the RS-11 power system as soon as the voltage and current requirements for the RS-11 equipment were established; this took place approximately two and one half months ago. No progress reports have been received from the contractor to date. [REDACTED], the project engineer, was requested to submit progress reports for Task Order 2 at an early date.

b. The AC power supply has been breadboarded. Full wave bridge rectification is accomplished with 4 200 ma silicon diodes. The contractor's attention was invited to a requirement for reasonably high internal impedance in the AC power supply in order to limit the current of the unbiased power amplifier in the RS-11 transmitter.

c. An inquiry was made into progress made in initiating a sub-contract for the hand crank generator development. [redacted] is soliciting a bid from the [redacted], New Hampshire, and upon its receipt plans to ask for authorization of the contracting officer to sub-contract in an amount of approximately \$5,000. The present sub-contract limit under the terms of RD-85 is \$1,000. It had been suggested earlier that [redacted] contact [redacted] Wisconsin, for hand crank generator sub-contractual work because of good recommendations to this Office by [redacted] [redacted] advised that they had contacted [redacted] but as yet had no reply. It was suggested that a follow-up letter be prepared since there is some possibility that [redacted] [redacted] would not be interested in small quantity production.

7. Task 3 RD-85 - [ ] is in receipt of task 3 of the RD-85 which requires the modification of the RS-11A to cover 4 to 16 mc/s. Four prototypes are to be provided with nomenclature as RS-11C. The task requires delivery 90 days after approval of the RS-11A/B prototype samples.

8. Additional design refinements - The laboratory is investigating the feasibility of placing a noise suppressing network in the audio stage of the receiver. A microampere meter movement has been developed by Weston for the A.F. which has a face diameter of  $3/4"$ . If the barrell length can be housed in the RT-11A/B case it is planned that this meter with diode rectifier and multipliers replace the present incandescent lamp tuning indicator for increased equipment reliability when operating into a low impedance antenna.

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The present low 70 ohm antenna impedance needs to be adjusted downward to accommodate shorter antennas approaching a quarter wave length at the operating frequency. (When the random length of antenna happens to approach a quarter wave length of the operating frequency the current may be as high as 500 ma. At lower frequencies the random length antenna does not approach the quarter wave length and a 70 ohm impedance is reasonable).

9. Comment - [ ] is well aware that certain design deficiencies in the RS-11A/B equipment exist and that comprehensive redesign may be necessary (in the case of the receiver). The government suggested, but has not demanded a comprehensive redesign under the fixed fee contract because the design difficulties can be traced to the deficiencies of the battery about which the equipment was to be designed. These deficiencies are not at least recognized in the case of the reduced capacity and remedied, in the case of bias voltage provisions. It is recommended that [ ] be given until mid-August to deliver an acceptable prototype sample receiver.

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